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TO: Thomas Carpenter, DFO, United States Environmental Protection Agency (sent via email to carpenter.thomas@epa.gov)

FROM: Reid Miner, Steve Prisley, Caroline Gaudreault - NCASI

SUBJECT: NCASI comments on the August 29, 2018 draft report for quality review from the EPA Science Advisory Board (SAB) on the topic of SAB's review of the 2014 draft *Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources*

NCASI is a non-profit environmental research institute focused on scientific and technical information addressing the environmental and sustainability needs of the forest-based industry in North America.

We appreciate the opportunity to comment on the August 29, 2018 draft report for quality review from the EPA Science Advisory Board (SAB) on the topic of SAB's review of the 2014 draft *Framework for Assessing Biogenic CO_2 Emissions from Stationary Sources.*

We wish to highlight four points relevant to the SAB review:

- Policy makers need to understand the potential consequences of using short time horizons to judge the CO_2 impact of policies;
    - *Near-term CO_2 emissions targets are not important because they result in near-term benefits but rather because they result in reduced long-term cumulative emissions of CO_2 which, according to modeling, will determine peak global temperatures.*
    - *Policies that judge mitigation measures only on near-term emissions could discourage the use of some forest bioenergy mitigation measures that accomplish significant long-term reductions in cumulative CO_2 emissions.*
    - *The time horizon used to judge the warming impacts of biogenic CO_2 should be the same as used for other GHGs.*
- Policy makers should be aware of the robust literature indicating that, in response to increased demand for wood, forest owners and managers in the U.S. undertake activities that reduce the carbon impacts of increased harvesting;
- There are significant carbon benefits of using manufacturing residuals for energy
    - *The literature shows that using manufacturing residuals for energy results in net zero biogenic emissions impact over short time horizons when compared to alternative management scenarios*

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- There are a number of important factors to consider when using a periodically updated reference point baseline.
    - *The insensitivity of global temperatures to short-term (e.g., multi-decadal) changes in carbon stocks and CO_2 emissions;*
    - *An averaging period adequate to buffer out temporary market- and management-related impacts;*
    - *An updating interval long enough to reduce the possibility that an updated baseline is distorted by temporary market- and management-related impacts;*
    - *Statistical techniques to ensure that excursions below the baseline are not due to random variation; and*
    - *Provisions allowing examination of the causes for excursions below the baseline to avoid penalizing wood markets for losses of carbon that are due to other causes (most notably, urban expansion and natural disturbances).*

In the following material, we elaborate on these points.

<u>The potential consequences of using short time horizons to judge the CO_2 impact of policies.</u>

The SAB's August 2018 draft correctly notes that the selection of a time horizon for assessing net emissions of GHGs is primarily a policy decision. That said, there are science-based considerations associated with the selection of a time horizon that policy makers need to understand.

Due to the large amounts of CO_2 already in the atmosphere, near-term changes in CO_2 emissions have little impact on near-term CO_2 in the atmosphere. IPCC indicates that in 2013 the atmosphere contained 828 Petagrams (Pg) of carbon (IPCC 2013) and that, considering all sources and sinks, this was increasing at a rate of 4 Pg C per year, an annual increase of less than one-half of one percent. Over time, this rate of increase becomes very significant, but on a year-to-year basis or even decadal basis, near-term changes in CO_2 emissions cause only small changes in the amounts of CO_2 in the atmosphere. It makes sense, therefore (as discussed below) that climate models indicate that global temperatures are relatively insensitive to near-term emission trends. The urgency associated with reducing CO_2 emissions in the near-term, therefore, is not associated with impacts related to near-term levels of CO_2 in the atmosphere. Instead, there are other reasons why near-term CO_2 emissions are important.

CO_2 has a long residence time in the atmosphere. Consequently, near-term emissions contribute directly to long-term cumulative CO_2 emissions, which according to IPCC analysis, will determine eventual peak global temperature. There is a robust body of literature on the timing of global temperature impacts attributable to CO_2. In summarizing this literature, IPCC states the following:

> "taking into account the available information from multiple lines of evidence (observations, models and process understanding), the near linear relationship between cumulative CO_2 emissions and peak global mean temperature is well established in the literature and robust for cumulative total CO_2 emissions up to about 2000 PgC [petagrams of carbon]. It is consistent with the relationship inferred from past cumulative CO_2 emissions and observed warming, is supported by process understanding of the carbon cycle and global energy balance, and emerges as a robust result from the entire hierarchy of models (IPCC 2013, p. 102)"

More recently, U.S. Global Change Research Program concluded that;

> "Large reductions in emissions of the long-lived GHGs [like CO_2] are estimated to have modest temperature effects in the near term (e.g., over one to two decades) because total atmospheric concentration levels require long periods to adjust, but are necessary in the long term to achieve any objective of preventing warming of any desired magnitude. Near-term projections of global mean surface temperature are therefore not strongly influenced by changes in near-term emissions but rather dominated by natural variability, the Earth system response to past and current GHG emissions, and by model spread (i.e., the different climate outcomes associated with different models using the same emissions pathway)." (USGCRP 2017 Pg. 394)

Ultimately, the urgency associated with calls to reduce near-term emissions is a reflection of the enormity of the task of reducing cumulative emissions and the difficult political and economic adjustments that will be required to do so. IPCC speaks directly to this in its Fifth Assessment Report, explaining that,

> "the concept of cumulative carbon … implies that higher initial emissions can be compensated by a faster decline in emissions later or by negative emissions. However, in the real world short-term and long-term goals are not independent and mitigation rates are limited by economic constraints and existing infrastructure (IPCC 2013, p. 1113)"

Policy makers need to understand, therefore, that near-term CO_2 emissions targets (e.g., the 2030 targets in the now-withdrawn Clean Power Plan) are important due to their contribution to reducing long-term cumulative emissions of CO_2 and not because they result in near-term benefits.

With this understanding, it becomes clear that mitigation measures to reduce CO_2 emissions should not be judged only on emissions reductions in the near-term. This is not normally an issue because, in most cases, mitigation measures reduce emissions in both the near- and long-terms. For instance, displacing fossil fuel-generated electricity with wind-generated electricity reduces both near-term and cumulative CO_2 emissions. Some forest bioenergy systems, however, can increase emissions in the near term even while they significantly reduce cumulative CO_2 emissions in the longer term relative to the use of competing systems. The timing of benefits varies among different measures and circumstances, but the principle remains and is supported by a rich body of literature. (See, for instance, Fargione et al. 2008, Gibbs et al. 2008, Jones et al. 2010, McKechnie et al. 2011, Mitchell et al. 2012, Zanchi et al. 2012, Agostini et al. 2013, Lamars and Junginger 2013, Lagiaiere et al. 2016, Brackley et al. 2017).

Therefore, it is important for policy makers to understand that policies that judge mitigation measures only on near-term emissions could discourage the use of some forest bioenergy mitigation measures that accomplish significant long-term carbon benefits.

In addition, policy makers need to understand that there is a policy-based time horizon embedded in many emissions targets. In specific, any policies that directly or indirectly make use of global warming potentials (GWPs) require the time horizon to be specified. Normally, 100-year GWPs are used, meaning that the warming impact of each gas (in terms of cumulative radiative forcing) is determined over 100 years and compared to CO_2. *It is scientifically inconsistent to use a short time horizon to characterize the net impacts of biogenic CO_2 when other GHGs are being judged over longer horizons.*

<u>In response to increased demand for wood, forest owners and managers undertake activities that reduce the carbon impacts of increased harvesting.</u>

We appreciate SAB's concern about the uncertainty introduced by the use of forest carbon models that consider both biophysical and economic factors. The SAB is on sound scientific ground when it recommends that any model used for determining net emissions of biogenic CO_2 in a regulatory context be thoroughly vetted to ensure it is appropriate for the task. That said, it is important that policy makers not be discouraged from considering the body of research based on the use of combined biophysical and economic models.

Studies that address both biophysical and economic factors show that when demand for wood increases, forest owners and managers in the U.S. undertake activities that increase supplies of wood and help mitigate the carbon-related impacts of increased harvesting. The size and timing of this investment response varies among studies, due in part to varying scenarios and uncertainties in the modeling, but the underlying message is clear. Studies that fail to account for the response of forest owners and managers overstate the carbon impacts of increased harvesting in the U.S. (See, for instance, Daigneault et al. 2012, Sedjo and Tian 2012, Nepal et al. 2014, Miner et al. 2014, Duden et al. 2017, Tian et al. 2018.)

The challenge for policy makers is to develop regulations that are robust in the face of modeling and scenario uncertainties while being informed by the large body of research showing that it is essential to consider economic factors and landowner responses when estimating the net biogenic carbon impacts associated with policies that increase demand for wood.

<u>Using manufacturing residuals for energy results in net zero biogenic GHG emissions in short time periods.</u>

Policy makers need to be aware of the literature examining the use of forest products industry manufacturing residuals for energy generation. This work indicates that using these residuals for energy results in net zero biogenic emissions impact over short time horizons when compared to alternative management scenarios involving (a) burning without energy recovery (black liquor solids, for instance) or (b) anaerobic decomposition involving methane production (landfilled woody mill residuals, treatment plant and deinking residuals, for instance). The biogenic carbon impacts of using these materials for energy are examined in Gaudreault et al. 2012, Lamars and Junginger 2013, and Gaudreault et al. 2015, among other studies.

<u>Policy makers need to consider several important factors when designing and implementing a periodically updated reference point baseline.</u>

The August 2018 draft SAB review correctly observes that while the anticipated baseline approach has conceptual advantages over the reference point baseline approach, these must be balanced against the uncertainties and implementation challenges associated with anticipated baselines. SAB appropriately highlights Buchholz et al. (2014) which concludes that "given the challenges in predicting the future status of forest resources, anticipated future baselines might be best suited for planning and policy development, while constant reference baselines might be more appropriate for monitoring and regulatory frameworks." The Buchholz et al. (2014) analysis also indicates that, based on the needs of specific monitoring frameworks, baselines of all types may need to be updated periodically. Given these considerations, the August 2018 SAB review suggests due consideration of an approach involving periodically updated reference point baselines. The SAB discussion of this approach is helpful but misses several important issues, discussed here.

Forest carbon stocks are always changing. At small spatial scales, these changes can be large. The atmosphere, however, responds to changes in CO_2 emissions over large spatial scales. Furthermore, forest management and investment responses occur over time and at large spatial scales. These and other considerations support SAB's recommendation that carbon impacts be judged at the regional scale or larger.

Temporal scales for assessing forest carbon stocks are also important, however. As noted above, short-term (e.g., mulit-decadal) increases in CO_2 emissions are relatively unimportant to global temperature except to the extent they contribute to long-term cumulative emissions. This provides important context for considering economic cycles and shifting age-class distributions that can cause temporary changes in carbon stocks. As long as these changes are temporary they are relatively unimportant to global temperature. This should be reflected in the design and implementation of policies based on periodically updated reference point baselines. Among the tools available to accomplish this are averaging periods, updating intervals and statistical tests.

The methods used to calculate, update and test against a reference point baseline will become increasingly important in the future as the rate of increase in forest carbon stocks in the U.S. slows (USDA 2016). Under these circumstances, cyclical factors will become increasingly likely to cause temporary reductions below baseline levels. A periodically updated reference point baseline approach needs to be designed to avoid unnecessary and administratively burdensome changes to emission factors over time. Careful selection of averaging periods, updating intervals and statistical tests can help avoid these unnecessary changes.

In the context of forest bioenergy policy, not only should forest carbon stocks be assessed at appropriate spatial and temporal scales, the causes of losses in forest carbon stocks should be understood. In many locations in the U.S., the primary threat to forest carbon stocks is urban expansion. In others, natural disturbances are causing large losses in forest carbon. Neither of these are attributable to forest bioenergy. Indeed, as noted above, forest bioenergy markets may help reduce these losses. Therefore, a forest bioenergy carbon accounting framework based on periodic measurement of forest carbon stocks should include provisions to identify the causes of carbon losses so that forest bioenergy is not held accountable for unrelated impacts.

Given these considerations, policy makers need to consider methods to make programs using periodically updated reference point baselines robust to (a) factors unrelated to the harvesting of wood and (b) temporary market- and management-related impacts. Among the factors to consider are the following:

- *The insensitivity of global temperatures to short-term (e.g., multi-decadal) changes in CO_2 emissions;*
- *The utility of an averaging period adequate to buffer out temporary market- and management-related impacts;*
- *The utility of an updating interval long enough to reduce the possibility that an updated baseline is distorted by temporary market- and management-related impacts;*
- *Statistical techniques that help ensure that excursions below the baseline are not due to random variation; and*
- *The value of examining the causes for excursions below the baseline to avoid penalizing wood markets for losses of carbon that are due to other causes (most notably, urban expansion and natural disturbances).*

We hope you find these comments helpful.

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